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(54) **INVERSE RENDERING OF A SCENE FROM A SINGLE IMAGE**

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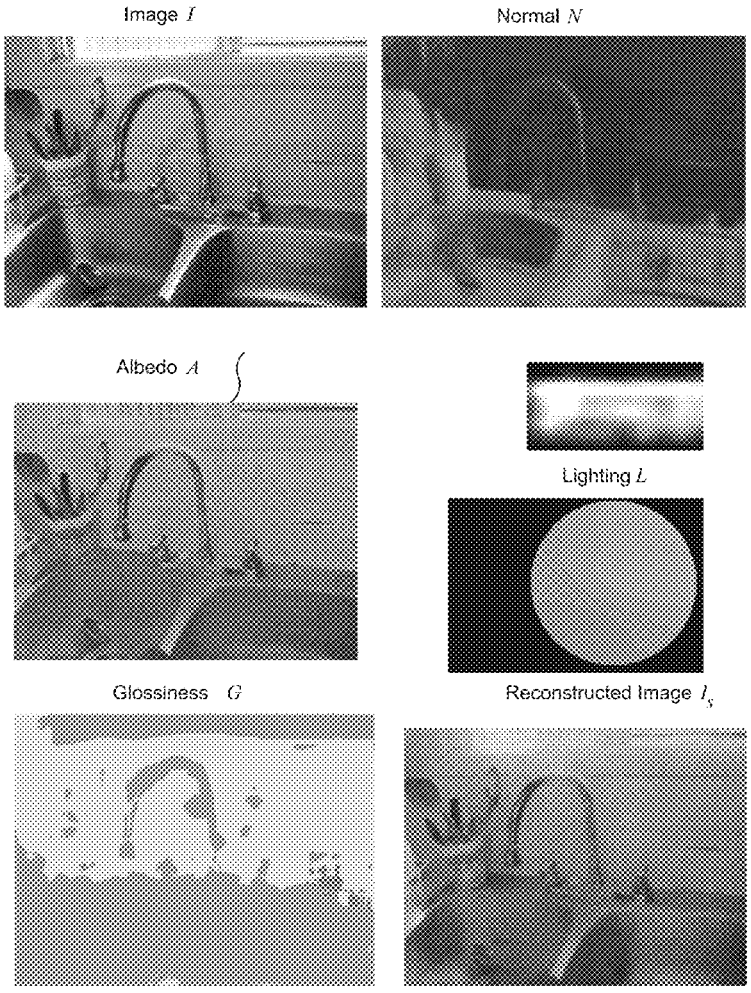
(57) **ABSTRACT**

Inverse rendering estimates physical scene attributes (e.g., reflectance, geometry, and lighting) from image(s) and is used for gaming, virtual reality, augmented reality, and robotics. An inverse rendering network (IRN) receives a single input image of a 3D scene and generates the physical scene attributes for the image. The IRN is trained by using the estimated physical scene attributes generated by the IRN to reproduce the input image and updating parameters of the IRN to reduce differences between the reproduced input image and the input image. A direct renderer and a residual appearance renderer (RAR) reproduce the input image. The RAR predicts a residual image representing complex appearance effects of the real (not synthetic) image based on features extracted from the image and the reflectance and geometry properties. The residual image represents near-field illumination, cast shadows, inter-reflections, and realistic shading that are not provided by the direct renderer.